

IN THE CLAIMS:

This listing of claims replaces all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method for operating a plasma enhanced chemical vapor deposition (PECVD) system to improve wafer to wafer film thickness uniformity, the method comprising:

performing a chamber seasoning process comprising a chamber cleaning process and a chamber pre-coating process, wherein the chamber cleaning process uses a remote plasma device, a first RF source, and a second RF source to form a plasma in a processing chamber with a first fluorine-containing gas, ~~an~~ a first oxygen-containing gas, or ~~an~~ a first inert gas, or a combination of two or more thereof, and wherein the chamber pre-coating process uses a silicon-containing precursor, a carbon containing precursor, or ~~an~~ a second inert gas, or a combination of two or more thereof, wherein the remote plasma device is coupled to the processing chamber using a valve, wherein the silicon-containing precursor comprises trimethylsilane (3MS), a 3MS flow rate varying from approximately 50 sccm to approximately 300 sccm, the second inert gas comprises Helium (He), a He flow rate varying from approximately 1000 sccm to approximately 2000 sccm, the first RF source power varying from approximately 600 W to approximately 1000 W, wherein a chamber pressure varies from approximately 4 Torr to approximately 10 Torr, and wherein the PECVD system comprises an upper electrode and a translatable substrate holder, a first gap being established between the upper electrode and the translatable substrate holder during the chamber cleaning process, wherein the first gap varies from approximately 5 mm to approximately 50 mm;

positioning a substrate on a substrate holder in the processing chamber;
depositing a film on the substrate, wherein a processing gas comprising a precursor is provided to the processing chamber during the deposition process; and
removing the substrate from the processing chamber; and
measuring the film on the substrate using an integrated metrology module configured to measure wafer film thickness.

2. (Original) The method as claimed in claim 1, further comprising:
positioning a new substrate on the substrate holder in the processing chamber;
depositing a film on the new substrate, wherein a processing gas comprising a precursor is provided to the processing chamber during the deposition process; and
removing the new substrate from the processing chamber.

3. (Currently Amended) The method as claimed in claim 2, further comprising:
performing a post-process chamber cleaning process, ~~wherein the post-process chamber cleaning process uses~~ using a second fluorine-containing gas, ~~an a second~~ oxygen-containing gas, or ~~an a third~~ inert gas, or a combination of two or more thereof.

4. (Currently Amended) The method as claimed in claim 3, wherein ~~the post-process chamber cleaning process uses the~~ second fluorine-containing gas ~~which comprises~~ NF_3 , CF_4 , C_2F_6 , C_3F_8 , C_4F_8 , SF_6 , CHF_3 , F_2 , or COF_2 , or a combination of two or more thereof.

5. (Currently Amended) The method as claimed in claim 3, wherein ~~the post-process chamber cleaning process uses the~~ second oxygen-containing gas ~~which comprises~~ H_2O , NO , N_2O , O_2 , O_3 , CO , or CO_2 , or a combination of two or more thereof.

6. (Currently Amended) The method as claimed in claim 3, wherein ~~the post-process chamber cleaning process uses the~~ third inert gas ~~which comprises~~ Ar, He, or N_2 , or a combination of two or more thereof.

7. (Original) The method as claimed in claim 3, further comprising:
positioning a dummy substrate on the substrate holder before performing the post-process chamber cleaning process; and
removing the dummy substrate after performing the post-process chamber cleaning process.

8. (Original) The method as claimed in claim 2, wherein the film on the substrate comprises a Tunable Etch Resistant ARC (TERA) material, and the film on the new substrate

comprises substantially the same TERA material.

9. (Original) The method as claimed in claim 1, wherein the film on the substrate comprises a Tunable Etch Resistant ARC (TERA) material.

10. (Original) The method as claimed in claim 1, further comprising:
positioning a dummy substrate on the substrate holder before performing the chamber seasoning process; and
removing the dummy substrate after performing the chamber seasoning process.

11. (Currently Amended) The method as claimed in claim 1, wherein ~~the chamber seasoning process includes the chamber cleaning process and the chamber cleaning process~~ employs the first fluorine-containing gas ~~comprising~~ comprises NF_3 , CF_4 , C_2F_6 , C_3F_8 , C_4F_8 , SF_6 , CHF_3 , F_2 , or COF_2 , or a combination of two or more thereof.

12. (Currently Amended) The method as claimed in claim 1, wherein the ~~chamber seasoning process includes the chamber cleaning process and the chamber cleaning process~~ employs the first oxygen-containing gas ~~comprising~~ comprises H_2O , NO , N_2O , O_2 , O_3 , CO , or CO_2 , or a combination of two or more thereof.

13. (Currently Amended) The method as claimed in claim 1, wherein ~~the chamber seasoning process includes the chamber pre-coating process and the chamber pre-coating process~~ employs the silicon-containing precursor ~~comprising~~ further comprises monosilane (SiH_4), tetraethylorthosilicate (TEOS), monomethylsilane (1MS), dimethylsilane (2MS), ~~trimethylsilane (3MS)~~, tetramethylsilane (4MS), octamethylcyclotetrasiloxane (OMCTS), tetramethylcyclotetrasilane (TMCTS), or dimethyldimethoxysilane (DMDMOS), or a combination of two or more thereof.

14. (Currently Amended) The method as claimed in claim 1, wherein the ~~chamber seasoning process includes the chamber pre-coating process and the chamber pre-coating process~~

employs the carbon-containing gas comprising CH_4 , C_2H_6 , C_2H_4 , C_2H_2 , C_6H_6 , or $\text{C}_6\text{H}_5\text{OH}$, or a combination of two or more thereof.

15. (Currently Amended) The method as claimed in claim 1, wherein ~~the chamber seasoning process includes the chamber cleaning process and the chamber cleaning process~~ employs the first inert gas ~~comprising~~ comprises Ar, He, or N_2 , or a combination of two or more thereof.

16. (Currently Amended) The method as claimed in claim 1, wherein ~~the chamber seasoning process includes the chamber pre-coating process and the chamber pre-coating process~~ employs the second inert gas ~~comprising~~ further comprises Ar, He, or N_2 , or a combination of ~~two or more~~ thereof.

17. (Previously Presented) The method as claimed in claim 1, wherein the chamber cleaning process further comprises:

operating the first RF source in a frequency range from approximately 0.1 MHz. to approximately 200 MHz; and

operating the first RF source in a power range from approximately 0 watts to approximately 10000 watts.

18. (Previously Presented) The method as claimed in claim 1, wherein the chamber pre-coating process further comprises:

operating the first RF source in a frequency range from approximately 0.1 MHz. to approximately 200 MHz; and

operating the first RF source in a power range from approximately 0 watts to approximately 10000 watts.

19. (Currently Amended) The method as claimed in claim 1, wherein the ~~PECVD system comprises an upper electrode and a translatable substrate holder and the chamber cleaning process further comprises:~~

~~establishing a first gap~~ is established during a first time; and establishing a second gap is

established between the upper electrode and the translatable substrate holder during a second time after the first time.

20. (Previously Presented) The method as claimed in claim 19, wherein the first gap is less than or equal to the second gap.

21. (Previously Presented) The method as claimed in claim 19, wherein the second gap is less than or equal to the first gap.

22. (Previously Presented) The method as claimed in claim 1, wherein the PECVD system comprises a temperature control system coupled to a substrate holder and the chamber seasoning process includes the chamber cleaning process which further comprises controlling the substrate holder temperature between approximately 0° C. and approximately 500° C.

23. (Previously Presented) The method as claimed in claim 1, wherein the PECVD system comprises a temperature control system coupled to a substrate holder and the chamber seasoning process includes the chamber pre-coating process which further comprises controlling the substrate holder temperature between approximately 0° C. and approximately 500° C.

24. (Previously Presented) The method as claimed in claim 1, wherein the PECVD system comprises a pressure control system coupled to the chamber and the chamber seasoning process includes the chamber cleaning process which further comprises controlling the chamber pressure between approximately 0.1 mTorr and approximately 100 Torr.

25. (Previously Presented) The method as claimed in claim 1, wherein the PECVD system comprises a pressure control system coupled to the chamber and the chamber seasoning process includes the chamber pre-coating process which further comprises controlling the chamber pressure between approximately 0.1 mTorr and approximately 100 Torr.

26. (Previously Presented) The method as claimed in claim 1, wherein the PECVD system comprises a temperature control system coupled to a chamber wall and the chamber

seasoning process includes the chamber cleaning process which further comprises controlling the chamber wall temperature between approximately 0° C. and approximately 500° C.

27. (Previously Presented) The method as claimed in claim 1, wherein the PECVD system comprises a temperature control system coupled to a shower plate assembly and the chamber seasoning process includes the chamber cleaning process which further comprises controlling the shower plate assembly temperature between approximately 0° C. and approximately 500° C.

28. (Previously Presented) The method as claimed in claim 1, wherein the film comprises a material having a refractive index (n) ranging from approximately 1.5 to approximately 2.5 when measured at a wavelength of at least one of: 248 nm, 193 nm, and 157 nm, and an extinction coefficient (k) ranging from approximately 0.1 to approximately 0.9 when measured at a wavelength of at least one of: 248 nm, 193 nm, and 157 nm.

29. (Withdrawn) A plasma enhanced chemical vapor deposition (PECVD) system comprising:
a plasma processing chamber;
a substrate holder configured within the plasma processing chamber; and
means for performing a chamber seasoning process, wherein the chamber seasoning process comprises a chamber cleaning process, or a chamber pre-coating process, or a combination thereof, wherein the chamber cleaning process, when employed, uses a fluorine-containing gas, an oxygen-containing gas, or an inert gas, or a combination of two or more thereof, and wherein the chamber pre-coating process, when employed, uses a silicon-containing precursor, a carbon containing precursor, or an inert gas, or a combination of two or more thereof.

30. (Withdrawn) The system as claimed in claim 29 further comprising:
means for positioning a new substrate on the substrate holder in the plasma processing chamber;

means for depositing a film on the new substrate, wherein a processing gas comprising a precursor is provided to the processing chamber during the deposition process; and
means for removing the new substrate from the plasma processing chamber.

31. (Withdrawn) The system as claimed in claim 29, further comprising: means for performing a post-process chamber cleaning process, wherein the post-process chamber cleaning process uses a fluorine-containing gas, an oxygen-containing gas, or an inert gas, or a combination of two or more thereof.

32. (Withdrawn) The system as claimed in claim 31, further comprising:
means for placing a dummy substrate on the substrate holder in the plasma processing chamber;

means for performing post process chamber cleaning process, wherein the post process chamber cleaning process uses a fluorine-containing gas, an oxygen-containing gas, or an inert gas, or a combination of two or more thereof; and

means for removing the dummy substrate from the substrate holder after post process chamber cleaning process.

33. (Withdrawn) The system as claimed in claim 29, wherein the film comprises a Tunable Etch Resistant ARC (TERA) material.

34. (Withdrawn) The system as claimed in claim 29, further comprising:
means for placing a dummy substrate on the substrate holder in the plasma processing chamber; and

means for removing the dummy substrate from the substrate holder after chamber seasoning process.